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ORIGINAL ARTICLE

The influence of context on residents' evaluations: effects of priming on clinical judgment and affect

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Abstract Different lines of research have suggested that context is important in acting and learning in the clinical workplace. It is not clear how contextual information influences residents' constructions of the situations in which they participate. The category accessibility paradigm from social psychology appears to offer an interesting perspective for studying this topic. We explored the effect of activating medically irrelevant mental concepts in one context, so-called 'priming', on residents' interpretations as reflected in their judgments in another, work-related context. Obstetric-gynecologic residents participated in two unrelated-tasks experiments. In the first experiment residents were asked to indicate affect about a change in a routine procedure after performing an ostensibly unrelated 'priming' task which activated the concept of either *ineffective coping* or *effective coping*. The second experiment concerned residents' patient management decisions in a menorrhagia case after 'priming' with either *action* or *holding off*. Contextually activated mental concepts lead to divergent affective and cognitive evaluations in a subsequent medical context. Residents are not aware of this effect. The strength of the effect varies with residents' level of experience. Context influences residents' constructions of a work-related situation by activating mental concepts which in turn affect how residents experience situations. Level of experience appears to play a mediating role in this process.

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Introduction

Learning in the clinical workplace

The traditional setting of graduate medical education is the clinical workplace. Despite recent reforms in residency training this situation is unlikely to change (Ludmerer and Johns 2005; Walter 2006). So far empirical studies have produced only limited understanding of the nature of residents' learning in the workplace (Kennedy et al. 2005; Schuwirth and van der Vleuten 2006). The focus of the dominant outlook is on the development of isolated individuals, independent of their sociocultural context (Swanwick 2005; Bleakley 2006). This view finds some of its origins in the cognitivist literature on experiential learning (Kolb 1984), reflective practice (Schön 1987), and adult learning theories (Knowles 1973). Although the cognitivist discourse provides valuable insights into the mental development of individuals, research into learning processes in workplaces paints a more intricate picture. Residents learn from interactions within the complex setting of clinical practice (Bleakley 2002; Pope et al. 2003). From a sociocultural perspective on learning it might be said that work-based experiences foster the socialization of residents as members of a variety of 'communities of practice' (Wenger 1998; Fuller et al. 2005). As Billett (2004) aptly put it: "workplaces provide interactions with human partners and non-human artifacts that contribute to individuals' capacity to perform and to the learning that arises from their performance". Teunissen and colleagues (2007) outlined a theoretical framework combining cognitivist and sociocultural features to clarify what happens when residents learn by participating in work-based activities. They argued that residents interpret their activities, for instance attending to a patient with renal failure, in light of both their personal knowledge and external input, such as the opinion of a supervising nephrologist. Residents assign significance and meaning to their work-related activities and this creates 'personal experiences' relating to different aspects of activities, such as treatment, communication, or teamwork. As a result 'personal knowledge' grows as residents progress through the training program. This continuous development of personal knowledge will be reflected in future interpretations of activities and events and construction of meaning. This description of workplace learning is in accordance with the constructivist perspective on learning.

Context matters, but how?

The constructivist theoretical framework holds that residents process and interpret information they derive from work-related activities and use these interpretations to construct what it is they are experiencing and what these experiences mean. Constructing meaning on the basis of their activities plays a central role in the learning of residents. The constructs they develop are reflected in their decisions and actions; they determine which questions a resident will ask, which hypotheses (s)he will pursue, which management strategies (s)he will recommend, and which emotions (s)he experiences (Norman 2005;

Illeris 2002). In other words, residents' constructions influence *what they decide to do as well as what they learn*. The literature on decision making offers some evidence of the impact of contextual information on the work of physicians and nurses (Eisenberg 1979; Marshall et al. 1992; Sprung and Eidelman 1997; Ellis and Nolan 2005). A study among Swiss intensive care physicians (Escher et al. 2004) asked them to decide on patient admission based on hypothetical patient scenarios. The results showed that decisions were influenced by a patient's personality and the availability of beds, although the importance of these factors was not acknowledged by the physicians in a separate questionnaire. Reports on life support decisions showed similar biases in physicians' choices (Pearlman et al. 1982; Christakis and Asch 1993). These findings make clear that context can bias physicians' evaluations, but they shed no light on the underlying mechanisms.

Our study starts from the notion that people construct meaning based on their experiences with activities in which they participate. This study is aimed at gaining a better understanding of how contextual information affects residents' constructions. Researching residents' constructions will help us to illuminate the processes involved in residents' learning. The pivotal mechanism addressed by this study is how contextual information impacts residents' constructions of certain situations as reflected in their affective evaluations and patient management decisions. In our search for the best approach to address this issue, we looked to the domain of social psychology and the clinical reasoning literature.

Lessons from social psychology

Framing

Since the 1970s social psychologists have investigated when, how, and in what direction 'activated mental concepts' affect people's impressions and judgments (Elstein 1988). This line of research gained momentum with two landmark papers by Tversky and Kahneman (1974) (Kahneman and Tversky 1973) on "the rules that determine intuitive predictions and judgments". Tversky and Kahneman showed that people's choices can be influenced by the way a decision problem is presented, even though the problem itself is the same. This effect is known as 'framing' (Tversky and Kahneman 1981). McNeil et al. (1982) demonstrated framing effects by asking experienced physicians, students trained in statistics, and patients to choose between surgery or radiation therapy in a hypothetical case of having lung cancer. The potential outcomes were presented in terms of chances of survival or death. Because a 90% chance of short-term survival seems less threatening than a 10% chance of immediate death, surgery was preferred substantially more often in the survival frame (85.5%) than it was in the mortality frame (65.5%). This large framing effect was observed in each of the three groups. The general effect of framing is enhanced accessibility of specific mental concepts. 'Accessibility' refers to the ease with which particular knowledge structures or mental concepts come to mind (Bruner 1957). It became an important concept in judgment analysis.

Priming

Higgins et al. (1977) and Srull and Wyer (1979) were among the first researchers to investigate 'priming'. A priming effect occurs when a mental concept is activated in one

situation and subsequently used in another, unrelated, situation, because its accessibility has been enhanced through activation. Srull and Wyer (1979) gave psychology students two unrelated tasks in an experiment to investigate priming effects. The first task was a word comprehension test, requiring participants to form complete sentences by underlining three words in sets of four. There were two priming conditions, one in which neutral sentences were mixed with sentences priming for hostility and one in which neutral sentences were mixed with sentences priming for kindness. The second, ostensibly unrelated, task required the students to judge a short vignette presenting a man, named Donald, whose behavior was ambiguous on the hostile/kind dimension. It turned out that participants' judgment of Donald's behavior was in accordance with the concept that was made more accessible to them by the priming task. In other words, an *'assimilation'* effect was observed.

Assimilation vs. contrast

Since the seminal Srull and Wyer (1979) studies, numerous studies have shown assimilative effects, not just of traits but also of accessible stereotypes, attitudes, moods, and emotions (Stapel and Koomen 2001). Other studies have demonstrated *'contrast'* effects due to accessible knowledge structures (Herr 1986; DeCoster and Claypool 2004). Dijksterhuis et al. (1998) showed that after priming with a stereotype associated with high intelligence (professors), participants in a general knowledge test outperformed participants primed with a low intelligence stereotype (super models); apparently, stereotype priming led to assimilation. However, the finding that participants primed with Albert Einstein performed worse than those primed with Claudia Schiffer, showed that distinct exemplars led to contrast. In their Interpretation Comparison Model (ICM), Stapel and Koomen (2001) examined when accessible information leads to contrast and when to assimilation. Their ICM focuses on the way accessible mental concepts are used to form an impression of a target. They argue that "distinct and comparison relevant information is more likely to be used as a comparison standard" and thus result in contrast, whereas "information that lacks these features is more likely to be used as an interpretation frame", yielding assimilation. Numerous studies in different domains have corroborated the ICM (Stapel et al. 1996; Stapel and Koomen 1998).

In summary, social psychology research has demonstrated that mental concepts, activated by a specific task and thus made accessible can affect people's judgment and behavior in another, ostensibly unrelated, task, without the persons concerned being aware of this effect (DeCoster and Claypool 2004). People may judge and behave either in accordance with primed concepts (assimilation) or in contrast to them (contrast). This body of knowledge may be helpful in understanding residents' constructions in the clinical workplace.

Clinical reasoning and biasing effects of context

In the preceding we took the social psychology perspective to try and understand how contextual input may influence residents' constructions of a situation, as reflected in affective evaluations and patient management decisions. Effects of the way information is processed have also been addressed in clinical reasoning research. Clinical reasoning focuses on "the processes doctors use to arrive at an initial diagnosis based on history and

physical examination" (Norman 2005). Can research findings from this field contribute to our understanding of how context impacts residents' constructions?

Studies on bias in clinical reasoning

Norman and colleagues examined how a specific exemplar of a disease might influence clinical reasoning (Regehr et al. 1994; Hatala et al. 1999; Leblanc et al. 2002; Norman 2005). Underlying this research is the idea that the categories people use to make sense of the world are, at least in part, defined by prior examples stored in memory. In a study by Hatala et al. (1999) clerks and family medicine residents were allocated to a prior-bias or no-prior-bias ECG instructional session, after which they participated in an ECG test. In the prior-bias condition, patient information (e.g. the patient is a 52-year-old banker) was coupled with a certain ECG diagnosis (e.g. myocardial infarction). In the ECG test the same patient information (gender, age, occupation) was given but the diagnosis was different (left bundle branch block). In the no-prior-bias condition there was no overlap between patient information in the instructional session and the ECG test. No effect was found for the clerks but in the prior-bias condition residents' diagnostic accuracy was only 23% compared to 46% in the no-prior-bias condition. Furthermore, LeBlanc et al. (2002) showed that suggesting a (correct or alternative) diagnosis in a case history was associated with bias in medical students' and family medicine residents' diagnoses and interpretation of features in favor of the suggested hypothesis.

Unanswered questions

These experiments provide evidence that prior examples or hypothesized diagnoses may affect the interpretation of clinical features as well as the resulting diagnosis. Several questions still remain to be answered to obtain a clear understanding of how contextual information that is not related to the situation of interest can influence residents' constructions of situations in the workplace. First, experiments in clinical reasoning have generally used case information, such as patient characteristics, which is objectively irrelevant to the diagnosis. However, despite being irrelevant to the diagnosis, patient characteristics are still a natural part of case presentations. This means that these experiments do little to elucidate the influence of contextually activated information that is not an integral part of a patient case. Second, the experimental manipulation is typically an instructional session on the same subject category as a subsequent test. So, although participants may be unaware of the manipulation in the instruction, they are aware that the session prepares them for a subsequent test. Consequently, these experiments are not suited to investigate if constructions can be influenced by (ostensibly) unrelated tasks. Third, traditionally, most researchers in this field have chosen "arriving at an initial diagnosis" as their central focus (McGuire 1985). Notwithstanding the critical importance of diagnostic reasoning in medicine, we were interested in residents' affective evaluations in the clinical workplace as well, precisely because previous research has tended to neglect this aspect. In order to gain a comprehensive understanding of how residents construct meaning, account should be taken of the way contextual influences affect not only cognitive but also affective dimensions of residents' constructions (Illeris 2002).

Research question

We set out to investigate how elements in the context affect residents' constructions of the activities in which they participate and, ultimately, their learning. In order to understand how constructions may be influenced, we turned to the social psychology literature and found that studies on 'priming' offer promising new research leads to compensate for the limitations of the clinical reasoning literature. We conducted two experiments in the field of obstetrics/gynecology to investigate the following research question: can contextual information activate mental concepts that subsequently influence residents' constructions of a situation, as reflected in their affective evaluations and patient management decisions?

We chose a study design resembling the designs used in social psychology research that are characterized as 'unrelated-tasks experiments' (DeCoster and Claypool 2004). Participants are presented with a sequence of tasks, where the aim of the first task (priming task) is to activate a certain mental concept. Participants are usually randomized to one of two priming conditions, targeting opposite ends of the spectrum of a mental concept. An example is Srull and Wyer's (1979) scrambled sentence test, where participants were primed with either hostility or kindness. A, seemingly unrelated, second task instructs participants to evaluate the description of a target person or situation. These evaluations serve as the dependent variable of the experiment in which the priming conditions are the independent variables.

Method

Participants and procedure

We recruited participants from two residency programs in the Amsterdam region in the Netherlands who attended one of four one-day courses on psychiatric disorders during pregnancy in September 2006. At the start of each course the first author or a research assistant explained to the participating residents that they were looking for volunteers to participate in a 15-min activity consisting of several short tasks later that day. When the experimenter returned at the end of the day to recruit volunteers all participants consented to participate, which meant there were between 11 and 16 participants from each of the four courses.

For this study we constructed two unrelated-tasks experiments to investigate priming effects. The first experiment investigated the effect of priming with either *ineffective* or *effective coping* on residents' affective evaluations of being forced to use a different routine procedure (experiment 1). The priming conditions (*ineffective and effective coping*) were the independent variables, while residents' scores on an affect rating scale were the dependent variable. The second unrelated-tasks experiment investigated the effect of priming with *action* or *holding off* (independent variables) on residents' management decisions in a menorrhagia case (dependent variable) (experiment 2). In both experiments, we used level of experience of the residents as a control variable, because of studies suggesting that personal knowledge and experience may play a moderating role. For instance, Teunissen and colleagues' (2007) theoretical framework of learning in the workplace posits that interpretations and meanings may vary depending on personal knowledge and Hatala and colleagues' (1999) study on the influence of a single example on ECG interpretation found that only residents but not medical students were biased by a prior example.

Although this study was exempt from ethical approval according to Dutch law, we dedicated considerable effort to protecting the interests of our participants. The researcher explained as much as possible about the content of the tasks but, in order to prevent suspicion about the research aims, the residents were told that the tasks were part of different research projects conducted by different universities in the Netherlands. The researcher had no professional or personal relationship with any of the course participants and participation was voluntary. All the forms used for the study were completed anonymously and the participants were informed that their demographic and personal characteristics would be used for research purposes only. Participants were encouraged to contact the researcher by email when they had any queries or concerns. No emails were received.

Materials

We developed a 16-page booklet, containing experiments 1 and 2. Table 1a and 1b show how the experiments were presented in the booklet. There were two versions of the booklet (A and B), which differed only in the priming conditions of the two experiments. Booklets A and B were handed out to the participants in random order. On page one the residents were told that the booklet contained four sets of unrelated tasks.

Experiment 1

Experiment 1 consisted of two sets of tasks investigating the influence of priming with *ineffective* or *effective coping* on affect regarding a change in a routine procedure in a new rotation. A short introduction on page two, was followed by a neutral filler task on page three, intended to ensure equal points of departure for both priming conditions. Booklet A and B differed with regard to the next task. In booklet A, the residents were asked to select six characteristics of *ineffective coping* from a list of nine and rank them in order of prevalence in the general population. In booklet B, the residents were asked to do the same for characteristics of *effective coping*. Page five was a filler page marking the transition to a new set of tasks. Page six introduced these tasks and participants were instructed to read each text very carefully. Page seven contained a description of an obstetric-gynecologic resident who is used to making an episiotomy before every vacuum extraction. On starting a rotation in another hospital the resident learns this is not acceptable and she is required to change her routine (Fig. 1). This description was the experiment's target scenario. Page eight opened with the instruction not to turn back to previous pages and then asked the participants to rate their feelings about the scenario on the previous page on three 6-point scales, ranging from "insecure"(1) to "challenged"(6), from "confused"(1) to "stimulated"(6), and from "demotivated"(1) to "motivated"(6). The weighted total score on these ratings was the dependent variable in this experiment. In this 'affect score' '1' signifies negative affect and '6' positive affect.

Experiment 2

The next two sets of tasks in the booklet comprised our second experiment investigating how priming with *action* or *holding off* affected a management decision for a patient with

Table 1a Overview of the study design for experiment 1.

Purpose of experiment 1				Priming task			Target scenario	Dependent variable
			Neutral filler task to create an equal point of departure for the experiment	Condition A primed for the concept of *ineffective coping* and condition B primed for *effective coping*			Description of target scenario	Weighted total score resulted in an affect score, which is the dependent variable in experiment 1
Page and lay-out[a]	1	2	3	4	5	6	7	8
	Presented as a set of tasks from university 'x'					Presented as a set of tasks from university 'y'		
Booklet A	Introduction of sets of tasks from 4 universities	Introduction of tasks from university 'x'	Indicate for 8 diagnosis whether the patient should be treated by a GP[b] or a gynecologist	Identify and rank 6 features of *ineffective coping* from a list of 9	Filler page	Introduction of tasks from university 'y'	Description of a change of routine after moving to another hospital (see Fig. 1)	Evaluate the situation on three 6-point rating scales
Booklet B	Idem	Idem	Idem	Identify and rank 6 features of *effective coping* from a list of 9	Idem	Idem	Idem	Idem

[a] The set of tasks with the priming task (independent variable) had to appear as unrelated to the judgment task (dependent variable)

[b]GP = General practitioner

Table 1b Overview of the study design for experiment 2.

Purpose of experiment 2				Priming task			Target scenario	Dependent variable
			Neutral filler task to create an equal point of departure for the experiment	Condition A primed for the concept of *action* and condition B primed for *holding off*			Description of target scenario	The patient management decision (on a 6-point scale) is the dependent variable in experiment 2
Page and lay-out[a]	9	10	11	12	13	14	15	16
	Presented as a set of tasks from university 'z'				Presented as a set of tasks from university 'w'			
Booklet A	Filler page	Introduction of tasks from university 'z'	Create 5 four-letter words from 13 random letters	10 sets of words; underline words that make a correct sentence; 7/10 conveyed *action*	Filler page	Introduction of tasks from university 'w'	Description of patient with menorrhagia (see Fig. 1)	Choose between watchful waiting strategy or hysterectomy and indicate certainty about choice
Booklet B	Idem	Idem	Idem	10 sets of words; underline words that make a correct sentence; 7/10 conveyed *holding off*	Idem	Idem	Idem	Idem

[a]The set of tasks with the priming task (independent variable) had to appear as unrelated to the judgment task (dependent variable)

Target scenario "challenging new situation" (page 7 of booklets A and B)

Suppose you are an obstetrics & gynecology resident and you have just completed your rotation in the general hospital. Your next rotation is in a different hospital where you find yourself confronted with the following situation.

You are required to change a procedure that you have become accustomed to and that has led to good results. You had become used to making an episiotomy before every vacuum extraction (VE) because of the protection it offers to the pelvic floor muscles. In your new hospital this procedure is not acceptable. You are not used to performing a VE without first performing an episiotomy.

Target scenario "menorrhagia case" (page 15 of booklets A and B)

As an obs/gyn resident you are conducting an out-patient consultation. You are seeing Mrs. Hubrechts, a 37-year-old lawyer of the Justice Department. She is a happily married mother of two. She has no medical history and uses no medication.

Her medical record shows that she has menorrhagia. Her menstrual flow is abnormally heavy, resulting in a one point hemoglobin drop during her periods. History and physical examination reveal no possible causes. A transvaginal ultrasound shows no abnormalities in the uterus.

Mrs. Hubrechts is reluctant to take hormones or other drugs that target the whole body. Due to negative experiences in the past she refuses to use an IUD. She wants the excessive bleeding to stop and prefers a hysterectomy.

Fig. 1 Target scenarios

menorrhagia. The presentation of the tasks was structured similarly to experiment 1. Page ten introduced the tasks, page eleven presented a neutral filler task, and the priming condition was presented on page 12. The latter was modeled on the scrambled sentence test first used by Srull and Wyer (1979). There were ten items, seven priming items and three neutral items, each consisting of a set of words. The participants were instructed to underline the words that would make a correct sentence. In booklet A the priming sentences conveyed *action* (e.g. "we deal are with it"), and in booklet B they conveyed *holding off* (e.g. "removed distance won't be it"). Page 13 was a filler page and page fourteen introduced the last set of tasks. Page 15 presented the target scenario of the experiment: a vignette of a 37-year-old woman with menorrhagia who wants to have a hysterectomy (Fig. 1). On page 16 the residents were asked to indicate on a 6-point scale whether they would opt for a "watchful waiting strategy" (1) or "hysterectomy" (6) and

how certain they were that this was the right decision (1 = very uncertain; 6 = very certain). This score was the dependent variable of experiment 2.

Final questions

After completing all the tasks, the participants were asked to fill out two forms, one asking for demographic and personal data and one with general questions about the booklet. The question of interest in the latter form was an awareness check whether participants thought that any of the tasks might have affected their answers on one of the other tasks.

Data analysis

A Chi-Square test was performed to compare the background characteristics of the study population with those of the general Dutch obstetric-gynecologic resident population in 2003 (Van der Velden et al. 2004). Pearson correlation coefficients were calculated to check if level of experience correlated with other background variables. Cronbach's alpha served as a measure of internal consistency for the affect scale of experiment 1. Two-factorial analysis of variance (ANOVA) was performed for both experiments: Priming Condition (booklet A vs. booklet B) and Training Phase (TP1 = postgraduate year (PGY) 1 + 2 vs. TP2 = PGY 3 + 4 vs. TP3 = PGY 5 + 6). Because the number of participants was small, we limited the groups with different levels of experience to three so as to preserve sufficient power to detect differences between the groups. Because of the increased probability of Type I error when multiple statistical tests are used on the same data set, we used Bonferroni adjusted alpha levels of .0167 (.05/3) per test in both experiments to identify significant differences due to priming within each training phase.

Results

A total of 54 residents participated in the study: 21 TP1 residents, 17 TP2 residents, and 16 TP3 residents. Two participants indicated that their answers might have been different if the tasks had been presented separately. Although we do not know if they suspected the real relationship between the tasks, these residents were excluded from further analysis. The other participants reported that they were not aware of any influence of a priming task on their evaluations of the subsequent target scenarios. A reanalysis on all subjects revealed no major deviations from the findings presented below. The remaining 52 participants yielded 50 fully completed booklets and background data. Table 2 presents the background characteristics of the participating residents in relation to the overall Dutch obstetric-gynecologic resident population (Van der Velden et al. 2004). No significant differences were found. Except for an expected correlation with age ($r = .57$, $p < .001$), there were no significant correlations between levels of experience (TP1, TP2, and TP3) and background variables such as gender, work site, clinical experience prior to residency, or university of graduation.

Affect in response to a challenging new situation

The first experiment investigated the effect of priming with *ineffective* or *effective coping* on the attribution of affect to a forced change in a routine procedure. The internal

Table 2 Descriptive statistics of the participants in relation to Dutch obs/gyn resident population

	Study population (%)	Dutch obs/gyn resident population[a](%)	
Women	78	72	X^2 (1, N = 50) = .86, p = .35
Men	22	28	
Age distribution			
≤34	76	72	X^2 (2, N = 50) = 2.56, p = .28
35–39	24	23	
≥40	0	5	
Work site			
University based hospital	42	46	X^2 (1, N = 50) = .37, p = .54
General hospital	58	56	

[a] Van der Velden et al. 2004

consistency of the affect score was acceptable (Cronbach's alpha .87). With the affect score ('1' = negative, '6' = positive) as the dependent variable, a 2 (Priming Condition) × 3 (Training Phase) ANOVA revealed a significant model (F(5, 44) = 4.78, p = .001) with no main effects of priming or training phase. There was a significant interaction effect (F(2, 44) = 10.24, $p < .001$). The priming task led to a contrastive effect in TP1, an assimilative effect in TP2, and hardly any effect in TP3 (Fig. 2). In TP1 the difference between the *ineffective coping* condition (M = 4.56, SD = .95) and the *effective coping* condition (M = 3.61, SD = .65) did not reach significance under the Bonferroni adjustment (F(1, 17) = 4.94, p = .04). There was a significant assimilative effect in TP2 (F(1, 15) = 13.32, p = .002) for the *ineffective coping* condition (M = 2.83, SD = 1.33) vs. the *effective coping* condition (M = 4.73, SD = .83).

In summary, we did not find the expected assimilative effect but instead we found a surprising tendency towards contrast in TP1. The expected assimilative effect was present in TP2; activating the concept of *ineffective coping* yielded a relatively negative affect whereas *effective coping* led to a relatively positive affect with regard to the target scenario. Priming did not appear to affect TP3 residents.

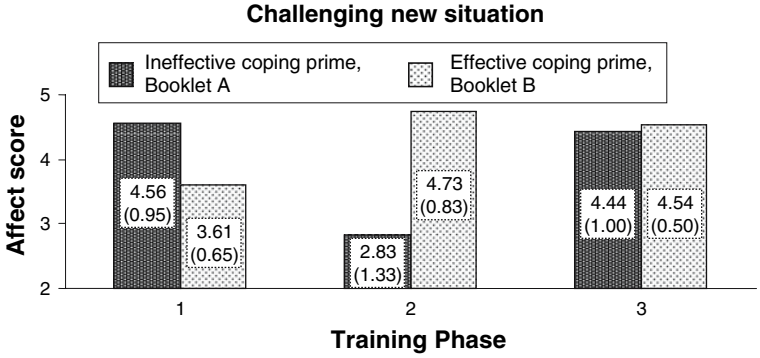

Fig. 2 Evaluations in experiment 1. An affect score of '1' signifies a negative and a score of '6' a positive affect. Mean scores and standard deviations are given in the bars. Each training phase (TP) comprises residents from two consecutive postgraduate years (PGY) (TP1 = PGY 1 + 2, TP2 = PGY 3 + 4, TP3 = PGY 5 + 6)

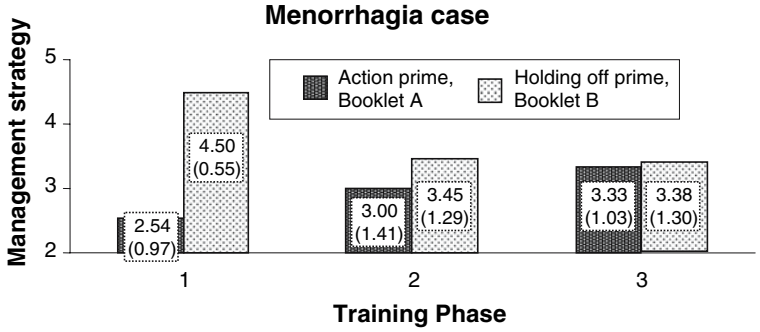

Fig. 3 Evaluations in experiment 2. On the management strategy scale, '1' is a strategy of watchful waiting and '6' hysterectomy. Mean scores and standard deviations are given in the bars. Each training phase (TP) comprises residents from two consecutive postgraduate years (PGY) (TP1 = PGY 1 + 2, TP2 = PGY 3 + 4, TP3 = PGY 5 + 6)

Decision on management strategy for a patient with menorrhagia

Experiment 2 investigated the effect of priming with *action* or *holding off* on a management decision for a patient with menorrhagia. With the score on the management rating scale ('1' = watchful waiting, '6' = hysterectomy) as dependent variable, the 2 (Priming Condition) × 3 (Training Phase) ANOVA led to a significant model ($F(5, 44) = 2.63$, $p = .036$) revealing a significant main effect of the priming condition ($F(1, 44) = 5.92$, $p = .019$). The main effect is a significant contrastive effect of priming in TP1 ($F(1, 17) = 21.09$, $p < .001$) for the *action* condition ($M = 2.54$, $SD = .97$) vs. the *holding off* condition ($M = 4.5$, $SD = .55$) (Fig. 3). The contrastive effect between the *action* condition ($M = 3.00$, $SD = 1.41$) and the *holding off* condition ($M = 3.45$, $SD = 1.29$) in TP2 was not significant ($F(1, 15) = .45$, $p = .51$) and there were no effects of priming in TP3. On the certainty rating scale ('1' = very uncertain and '6' = very certain) all residents reported a moderately high degree of certainty regarding their decision ($M = 4.46$, $SD = 1.16$). There were no significant differences in certainty between any of the study groups ($F(5, 44) = .89$, $p = .49$).

In summary, TP1 residents primed with *holding off* decided in favor of a hysterectomy significantly more often than did those primed with *action*, who favored a watchful waiting strategy. This is a contrastive effect. There was a small contrastive tendency in TP2. Priming had no effect on TP3 residents.

Discussion

We investigated if activating (medically irrelevant) mental concepts influenced residents' constructions as reflected in their evaluations of (work-related) situations, without the residents being aware of this. In our first experiment residents rated affect in relation to a challenging new situation. Accessibility of the concept of either *ineffective* or *effective coping* led to a significant assimilative effect in the ratings of residents in years three and four. By contrast, among year one and year two residents a tendency towards a contrastive effect was observed. The second experiment asked residents to decide between a strategy of watchful waiting and hysterectomy for a woman with menorrhagia. Accessibility of

either *action* or *holding off* yielded a significant contrastive effect in the decisions of year 1 and year 2 residents. The decisions of year 3and year 4 residents showed a similar but less marked contrastive tendency. In both experiments no effect of priming was found for the residents in the final years of specialist training.

Explanations

How to interpret these varying results in terms of the impact of contextually activated mental concepts? Findings from research in social psychology and medical education appear to provide some intriguing answers. First of all, it is remarkable that the effects of priming in both experiments varied noticeably with residents' levels of experience.

Lack of ambiguity

A plausible explanation for the absence of a priming effect in residents in TP3 in experiment 1 and in residents in TP2 and TP3 in experiment 2 may be the relative lack of ambiguity in the target scenarios. When a target scenario is unambiguous in relation to previously activated mental concepts, these mental concepts are unlikely to affect the judgment process (Stapel and Koomen 2001). Residents in the final years of training are probably equally capable of performing a vacuum extraction with and without an episiotomy and are unlikely to regard our scenario as challenging. This may explain the moderately positive affect for both priming conditions. Similarly, residents' increasing clinical experience may decrease the likelihood of extreme judgments in the menorrhagia case. The mean scores of the most experienced residents were in the middle of the rating scale, which is indicative of their appreciation of the difficulty of the choice they were asked to make.

Resident burn-out

The effect of priming on TP2 residents' affect in response to a challenging new situation (experiment 1) was in line with our expectations. We used the global concepts of *ineffective* and *effective coping* for priming. These concepts had no distinctive features and could not be used as a benchmark for the target scenario. As a result an assimilation effect seemed plausible (Stapel and Koomen 2001). This contrasts with the surprising result in the residents in TP1 where we found not only an absence of assimilation but a tendency towards a contrastive effect. This unforeseen effect requires clarification. One possible explanation lies in the role played by distinctness in steering priming effects (see Stapel and Koomen 2001). Priming with distinct concepts leads to contrast (Herr 1986; Dijksterhuis et al. 1998) because such concepts have relatively clear boundaries and are therefore more likely to be used as a comparison standard (Stapel and Koomen 2001). The literature on resident burn-out (Thomas 2004) suggests that coping in new situations may well be such a distinct and concrete concept for residents in TP1. Although perceived stress is high throughout residency, several studies have revealed increased burn-out rates in the first year followed by a decrease in the second year (Bellini et al. 2002; Tzischinsky et al. 2001). Burn-out results from chronic depletion of a person's coping resources. This

characterization of the natural history of residents' coping resources may offer an explanation for the tendency towards a contrastive effect in TP1.

Blatant priming induces contrast

The priming task in the second experiment was modeled on scrambled sentence tests, a common type of test in social psychology research (DeCoster and Claypool 2004). It led to contrastive effects in the decisions of TP1 residents. Contrastive effects are a well-studied phenomenon in the social psychology literature. One of its causes is the priming technique. Judging from residents' remarks during and after this task, the word tests stood out among the other tasks. According to the experimenters, the residents perceived these tasks as unfamiliar, failed to see any relationship with the medical context, and some residents felt they were being tested on grammar. This type of priming is called 'blatant priming'. It leads to consciousness of the priming event at the time the target scenario has to be evaluated and is known to induce contrast effects, even with global concepts (Lombardi et al. 1987; Newman and Uleman 1990). Blatantly primed concepts are still within range when the target scenario is evaluated and serve as an anchor resulting in contrastive effects. This does not alter the fact that participants reported that they were not aware of the influence of the unfamiliar priming task on their evaluation of the target scenario. This finding extends the clinical reasoning literature on biasing effects of context by showing that contextual influences may bias individuals in a contrasting direction as well.

Understanding workplace learning

Many questions concerning effects of context on residents' learning processes have remained unanswered in the medical educational literature (Ellstrom 2001; Schuwirth and van der Vleuten 2006). In the introduction we argued that residents' constructions play a central role both in learning and in their evaluations and decisions. What do our findings add to the slowly accumulating understanding of learning in the clinical workplace?

Learning as interplay of 'activity', 'personal knowledge', and 'context'

What residents learn results from the meanings they attribute to their experiences (Teunissen et al. 2007). Both meanings and experiences are constructions of the world in which residents are participating (Boghossian 2006; Prawat and Floden 1994). This research suggests that there are at least three variables involved in building these constructs. Obviously, the first variable is the activity, for instance making a decision about a patient with menorrhagia, as in experiment 2. The second variable is level of experience, in other words, residents' personal knowledge, in this case about treating patients with menorrhagia. The third variable is contextual information. Our results provide insight into one of several possible mechanisms by which contextual information contributes to the process of meaning construction. Contextual information activates certain aspects of a resident's personal knowledge (mental concepts) and makes these relatively more accessible and therefore more likely to influence the construction process.

Exploring a link between cognitivist and sociocultural discourse

In the introduction we referred to two perspectives on medical specialist training: cognitivist and sociocultural discourse. We agree with Sfard and others that these perspectives represent differing rather than competing views (Greeno 1989; Rogoff 1990; Sfard 1998). Cognitivist and sociocultural insights both have a contribution to make to a comprehensive understanding of how residents learn in workplaces. This point of view points to a second way in which this research adds to our understanding of workplace learning. According to Billett (1996) "a common characteristic of both views is the emphasis on interpretations of tasks against a background of past experience and intellectual resources or ontogenetic development". It is in this area that our research is situated. Exploring links between cognitivist and sociocultural discourse may strengthen the empirical foundations of both. We used the concept of 'category accessibility' to investigate the influence of context, prominent in sociocultural discourse, on individuals mental construction of a certain situation, a cognitivistic theme. This exploration of links between cognitivist and sociocultural discourse may contribute to the common goal of understanding how residents learn in the workplace.

Strengths and weaknesses

In this study we adapted research methods from social psychology. Although these methods are well established, we had to develop new research materials, such as priming tasks and target scenarios. This resulted in unexpected outcomes. We did not anticipate the observed tendency towards contrast in TP1 residents in experiment 1. On the other hand, the relatively high level of certainty in all groups in experiment 2 and the fact that the participants did not report being aware of an effect of the priming tasks, indicate that we did successfully manage to prime our participants. Nonetheless, other research materials might have produced more unequivocal results.

Another limitation of this research is the relatively small number of participating residents. A larger study group would have enabled more differentiation between levels of experience, without loss of power to detect significant effects. However, given the absence of significant differences between our study group and the overall Dutch obstetric-gynecologic resident population on a number of background variables, we appear to have studied a representative sample, which enhances the generalizability of our results.

A hypothetical case study inevitably omits aspects of the real world. This does not mean, however, that residents would perform 'better' in situations in day-to-day clinical practice. On the contrary, the complexity of the real world would probably promote cognitive overload and distraction. As Elstein (1988) put it, "laboratory studies provide an opportunity to display the best of clinical judgment, undistracted by competing demands".

In this research we combined several lines of research and successfully took a first step in a new direction. Using theoretical underpinnings from social psychology, we extended our understanding of how residents interpret tasks against the background of contextual influences and their experience. The strength of our findings does not lie in the particularities of the cases we used, but in the underlying principles of ways in which contextual information may influence residents' learning processes.

Future directions

Our research points to implications in two areas. First, our findings are of importance to those involved in the learning processes of residents (residents, consultants, nurses, allied health professionals, as well as patients). The influence of contextual information on judgments was most pronounced among inexperienced residents. This asks for appropriate measures regarding supervision and guidance (at least) in the first years of residency training, while still giving residents the opportunity to learn from their experiences. This should not be understood as an exhortation to tell residents what they should or should not do in order to avoid mistakes. Rather it means that residents should be encouraged to explain their clinical findings and proposed management strategies to reveal any variations and differences of opinion before treatment is actually commenced. Perhaps the most important message to be derived from our findings is that personal experiences of the same situation may vary. Although this message is not new (Bateson 1979; Pearlman et al. 1982), it is often ignored. A beginning resident cannot be assumed to 'see' what a more experienced resident or supervisor will 'see' nor, for that matter, can it be assumed that residents are learning what a supervisor or teacher thinks they are learning. The surprising outcome of experiment 1 for TP1 residents only adds to the strength of this statement.

Second, as we have stated before, this study is only a first step in a new direction. Our results should be replicated and extended to other medical specialties and different cases. Staff and researchers in the undergraduate medical education domain and in the field of nursing and allied health professions' education can also benefit from and build on our findings. Experiments should be conducted to tease out the relationship between activity, level of experience, and contextual information. Follow-up research needs to explore if lack of ambiguity and resident burn-out are indeed accurate explanations for some of our results.

Findings from social psychology can guide further investigations into the influence of activated mental concepts. There may be more ways in which context influences interpretation and construction of meaning, besides activating mental concepts. Qualitative studies, such as Ellis and Nolan's (2005) investigation of the influence of context or 'practice milieu' on the success of nurses' continuing education, may offer a complementary method of investigating the impact and significance of context. Finding links between the sociocultural settings in which people act and the mental processes of individual actors may reveal more connections between the cognitivist and the sociocultural discourse. We deem this to be an important challenge for those trying to understand the mechanisms of acting and learning in the clinical workplace.

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